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मानक

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“Knowledge is such a treasure which cannot be stolen”

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भारतीय मानक

(Reaffirmed 2004)

विद्युत तकनीकी शब्दावली

भाग 75 स्वचालित नियंत्रण

Indian Standard

ELECTROTECHNICAL VOCABULARY

PART 75 AUTOMATIC CONTROL

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NATIONAL FOREWORD

This Indian Standard (Part 75) which is identical with IEC Pub 50 (351) (1975) 'International electrotechnical vocabulary — Chapter 351 : Automatic control', issued by the International Electrotechnical Commission (IEC), was adopted by the Bureau of Indian Standards on the recommendation of the Basic Electrotechnical Standards Sectional Committee and approval of the Electrotechnical Division Council.

Only the English text given in the IEC publication has been retained while adopting as Indian Standard, and as such the page numbers given here are not same as in IEC publication.

Indian Standard

ELECTROTECHNICAL VOCABULARY

PART 75 AUTOMATIC CONTROL

Section 351-01 — General Terms

351-01-01

system

Set of interdependent elements constituted to achieve a given objective by performing a specified function.

Note. — The system is considered to be separated from the environment and other external systems by an imaginary surface which cuts the links between them and the considered system. Through these links, the system is affected by the environment, is acted upon by the external systems, or acts itself on the environment or the external systems.

351-01-02

linear system

System which can be described by a set of linear equations.

Note. — In this vocabulary, the linear systems are considered to be also time invariant.

351-01-03

process

Set of operations which perform a physical or chemical transformation or a series of such transformations.

Note. — Transportation of matter or energy, transmission of information can be considered as processes.

351-01-04

control

Purposeful action on or in a system, to meet specified objectives.

Note. — Control may include monitoring and safeguarding besides the control action itself.

351-01-05

monitoring

Observation of the operation of a system or part of a system to verify correct functioning by detecting incorrect functioning; this being done by measuring one or more variables of the system and comparing the measured values with the specified values.

351-01-06

.....

The control and monitoring operations of a system including where appropriate those operations which ensure reliability and safeguarding.

351-01-07

manual control

Type of control in which man operates either directly or indirectly on the final controlling element.

351-01-08

automatic control

Type of control in which a direct or indirect action of man on the final controlling element is not needed.

351-01-09

open-loop control

Control which does not utilize the measurement of the controlled variable.

351-01-10

feedback control

closed-loop control

Control in which the control action is made to depend on the measurement of the controlled variable.

351-01-11

control with fixed set-point

Feedback control by which the controlled variable is made to remain substantially constant.

Note. — The controlled variable may then be called a regulated variable.

351-01-12

follow-up control

Feedback control by which the controlled variable is made to vary according to the variations of a reference variable.

351-01-13

time-programme

A plan which prescribes the actions on a system as a function of time only.

351-01-14

sequential programme

A plan which prescribes the actions on a system in a predetermined order and in which some actions depend on the execution of preceding ones or on the fulfilment of certain conditions.

351-01-15

programmed control

Control in which a programme is executed.

351-01-16

sequential control

Control in which a sequential programme is executed.

351-01-17

controlled system

System on which control is exerted.

351-01-18

controlling system

controlling equipment

System comprising all the elements which control the controlled system.

Note. — In feedback control, this includes also any elements in the feedback path.

351-01-19

control system

System constituted by a controlled system and its controlling system (equipment).

351-01-20

controller

In the controlling equipment of a feedback control

system, an element that combines two or more functions of the controlling system; one of these must be comparison between a feedback signal and a reference signal; the other functions may be amplification, equalization, etc.

351-01-21

automatic

Self-acting (not needing human operator) within a well-defined task.

351-01-22

automate

To modify an installation to reduce human intervention by using automatic equipment.

Section 351-02 — Variables and Signals

351-02-01

(variable) quantity

A quantity or condition whose value is subject to change and can usually be measured.

Note. — The term "variable" alone is frequently used to circumvent the lengthy but correct denomination "variable quantity".

351-02-02

input variable

Variable applied to a system and which is independent of the other variables of the system.

351-02-03

output variable

Variable delivered by a system.

351-02-04

controlled variable

Output variable of the controlled system.

351-02-05

manipulated variable

Output variable of the controlling system, which is also an input variable of the controlled system.

351-02-06

reference variable

Constant or time-dependent input variable of a control system, which variable the controlled variable desirable should reproduce.

351-02-07

disturbance

Undesired and most frequently unpredictable change in an input variable, other than the reference variable.

351-02-08

signal

Measurable variable, one or more parameters of which carry information about one or more variables which the signal represents.

These parameters are called "information parameters" of the signal.

Examples. — For an amplitude-modulated sinusoidal carrier, the instantaneous amplitude is the information parameter of the signal; for a duration - or position-modulated pulse signal, the duration (or width) or the position of each pulse respectively is the information parameter of the signal.

351-02-09

set-point

A signal representing the reference variable.

351-02-10

feedback signal

Signal depending on the controlled variable and returned to a comparing element.

351-02-11

error signal

Output signal of a comparing element of a feedback control system.

351-02-12

quantization

Process by which the range of a variable is divided into a finite number of distinct sub-ranges not necessarily equal, each of which is represented by an assigned value named quantized value.

351-02-13

quantized signal

Signal having a quantized information parameter.

351-02-14

digital signal

Quantized signal the information parameter of which represents numbers.

351-02-15

binary signal

Quantized signal with two values conventionally denoted 0 and 1.

351-02-16

analogue signal

Signal the information parameter of which may assume all values of a given range.

351-02-17

sampled signal

Signal representing a variable which is only intermittently observed and represented.

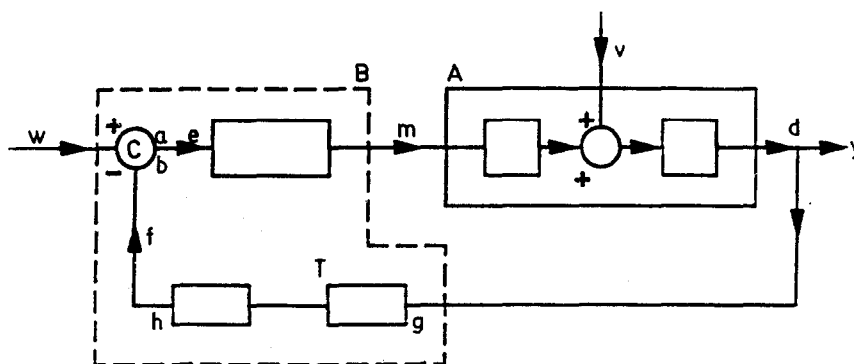


FIGURE 1

(to accompany sections 351-02 and 351-03)

Block diagram indicating typical elements of an elementary automatic feedback control system

Functional block identification

- ad = forward path.
- dghb = feedback path.
- A = controlled system.
- B = controlling system.
- C = comparing element.
- T = measuring transducer.

Note.— *a, b, d, g, h* are identification letters for the functional chains.

Signal identification

- w = reference variable.
- y = controlled variable.
- m = manipulated variable.
- f = feedback signal.
- e = error signal.
- v = disturbance.

Section 351-03 — Block Diagram Nomenclature

351-03-01

functional block

Representation of an assembly of functionally inter-related elements by means of a graphical envelope symbol associated with the functional relationship which exist between the input and output signals.

351-03-02

block diagram

Relatively simple diagram to facilitate the understanding of the principle of operation of a system. It is a diagram in which a system or part of a system, together with its functional

relationships, are represented by symbols, block symbols or pictures, here called functional blocks, without necessarily showing all the connections.

Note 1. — In this document, the functional blocks are linked by oriented connections which represent the signal flow.

Note 2. — A block diagram for a feedback control system contains at least:

- an input
- an output
- a comparing element
- a forward path
- a feedback path

351-03-03

functional chain

Sub-assembly of functional blocks extracted from a block diagram by cutting only two connections.

351-03-04

comparing element

Functional block with two inputs and one output, the output signal being the difference between the two input signals.

351-03-05

forward path

Functional chain linking the output of a comparing element to the output of the controlled system.

351-03-06

feedback path

Functional chain linking an output of the controlled

system to one input of the relevant comparing element.

351-03-07

main feedback path

Feedback path linking the output of the controlled system to one input of the comparing element nearest the input of the control system.

351-03-08

control loop

Assembly of elements comprising a comparing element, the corresponding forward path and the corresponding feedback path.

Note. — Sometimes a control loop may enclose others, in which case it is called the main loop; the enclosed ones are called minor, subsidiary, secondary, auxiliary or local loops.

Section 351-04 — Performance Characteristics

351-04-01

characteristic curve

Graph (curve) which shows the values, in steady-state, of an output variable of a system as a function of an input variable, the other input variables being maintained at specified constant values.

Note. — When the other input variables are treated as parameters, a set of characteristic curves is obtained.

351-04-02

saturation

Phenomenon represented by the part of a characteristic curve for which the ordinates (which represent the output variable) show a negligible additional change for any further increase of the abscissae (which represent the input variable).

351-04-03

**dead band
dead zone**

Finite range of values within which a variation of the input variable does not produce any significant change in the output variable.

Note. — When this type of characteristic is intentional, it is sometimes called a neutral zone.

351-04-04

hysteresis

Phenomenon represented by a characteristic curve which has a branch, called ascending branch, for increasing values of the input variable, and a different branch, called descending branch, for decreasing values of the input variable.

Note. — Sometimes a dead band effect can be superposed on a hysteresis phenomenon.

351-04-05

inherent characteristic of a system

Characteristic curve showing the relationship in

steady-state between an output variable (practically the controlled variable) and one of the input variables of the system, with any controlling equipment disconnected and for fixed values of the other input variables.

351-04-06

control characteristic of a controlled system

For an automatic control system with fixed set-point, characteristic curve showing the relationship in steady-state between the controlled variable and an input variable.

351-04-07

transient

The behaviour of a variable during transition between two steady states.

351-04-08

time response

The variation in time of an output variable of a system, produced by a specified variation of one of the input variables.

351-04-09

step response

The time response of a system produced by a step-wise variation of one of the input variables.

Note. — When the variation of the input variable is equal to one unit, the step response is called the *unit step response*.

351-04-10

**weighting function
unit impulse response**

The time response of a system produced by the application of a delta function (unit-impulse function) on one of the inputs.

Note. — The weighting function is, for a linear system, the time derivative of the *unit step response*.

351-04-11

transfer function

In a linear system, ratio of the Laplace transform of an output signal to the Laplace transform of the corresponding input signal, with all initial conditions zero.

351-04-12

frequency response

For a linear system, the ratio of the Fourier transform of the output signal to the Fourier transform of the corresponding input signal.

Note. — The frequency response coincides with the transfer function taken on the imaginary axis of the complex plane.

351-04-13

open-loop frequency response

Product of the frequency responses of the forward path and of the feedback path.

Note. — The open-loop gain and the open-loop phase angle are respectively the absolute value and the argument of the open-loop frequency response.

351-04-14

gain

For a linear system in sinusoidal steady-state, the ratio of the amplitude of the output signal to the amplitude of the corresponding input signal.

Note. — The gain is the absolute value of the frequency response.

351-04-15

logarithmic gain

If G is the gain of the linear system, its logarithmic gain, expressed in decibels, is $20 \log G$.

351-04-16

phase angle

For a linear system in sinusoidal steady-state, phase difference between the output signal and the corresponding input signal.

Note. — The phase angle is the argument of the frequency response.

351-04-17

frequency response characteristic

Bode diagram

Graphical representation of logarithmic gain and phase angle as functions of the frequency, which is usually represented on a logarithmic scale.

351-04-18

describing function

For a non-linear element in steady-state, with a sinusoidal input signal, the frequency response obtained by taking only the fundamental component of the output signal.

Note. — The describing function may depend on the frequency and on the amplitude of the input signal, or only on the amplitude of the input signal.

351-04-19

settling time

Time interval between the step change of an input signal and the instant when the resulting variation of the output signal does not deviate more than a specified tolerance, for instance 5%, from its final steady-state value.

351-04-20

rise time

For a step response, the time interval between the instant when the output signal, starting from zero, reaches a small specified percentage (for instance 10%) of the final steady-state value, and the instant when it reaches for the first time a large specified percentage (for instance 90%) of the same steady-state value.

351-04-21

dead time

delay

Time interval between the instant when a variation of an input variable is produced and the instant when the consequent variation of the output variable starts.

351-04-22

distance-velocity lag

A delay attributable to the transport of material or to the finite rate of propagation of a signal.

351-04-23

overshoot

For a step response, the maximum transient deviation from the final steady-state value of the output variable, expressed in % of the difference between the final and the original steady-state values.

351-04-24

actual value

The value of a variable at a given instant.

351-04-25

desired value

The value of a variable wanted at given instant, under specified conditions.

351-04-26

deviation

Difference between the desired value and the actual value of a variable at a given instant.

Note. — This definition applies whether the desired value is constant or varies in time.

351-04-27

system deviation

For a control system, the difference between the reference variable and the controlled variable at a given instant.

351-04-28

steady-state deviation

Steady-state value of the system deviation when all input variables are maintained constant.

351-04-29

steady-state deviation of the n th order

Steady-state value of the system deviation when the n th derivative of one input variable is maintained constant and the other input variables are constant.

351-04-30

offset coefficient

Absolute value of the slope of the tangent to a control characteristic at a given point.

Note. — The offset coefficient and the steady-state deviation are expressed by the same number when the same units are used for the input variable and the controlled variable in both cases.

351-04-31

absence of offset

zero offset

Property of a control system the control characteristic of which is horizontal, i.e. whose steady-state deviation is zero.

351-04-32

stability of a linear system

For a linear system, the property such that, after having been displaced from its steady-state condition by an external disturbance, it comes back to that steady-state condition when the disturbance has ceased.

351-04-33

absolute stability of a linear system

For a linear single-loop control system, the property such that there exists a limiting value of the static open-loop gain such that the system is stable for all lower values of that gain and unstable for all higher values.

351-04-34

conditional stability of a linear system

For a linear single-loop control system, the property of being stable for a certain interval of values of the static open-loop gain and unstable for certain lower and higher values of that gain.

351-04-35

gain margin

For an absolutely stable feedback system, the reciprocal of the open-loop gain at the frequency at which the phase angle reaches $-\pi$ rad.

351-04-36

phase margin

For an absolutely stable feedback system, the difference between π rad and the absolute value of the open-loop phase angle at the frequency at which the open-loop gain is unity.

351-04-37

hunting

Usually undesirable self-sustained periodic oscillation in a control system.

351-04-38

damping (of an oscillation)

Progressive reduction with time of the amplitude of an oscillation.

351-04-39

damping ratio

For a linear system of the second order described by the differential equation

$$\frac{d^2x}{dt^2} + 2D\omega_0 \frac{dx}{dt} + \omega_0^2 x = 0$$

the damping ratio is the value of the factor D .

Note. — ω_0 is called the *angular resonance frequency* of the system.

351-04-40

performance index

Mathematical expression which characterizes the quality of control under specified conditions.

351-04-41

optimal control

Control for which the performance index reaches a maximum or a minimum under specified limitations.

Section 351-05 — Functioning

351-05-01

type of action of an element

For an element, the way in which the input variable affects the output variable.

Note. — Distinction is made between permanent and intermittent action.

351-05-02

modulating action

Type of action in which the output variable results from modulation of a carrier by the input variable.

351-05-03

sampling action

Type of intermittent action in which the output variable

represents samples of the input variable.

Note. — Amplitude or duration modulation of a pulse signal are types of sampling actions.

351-05-04

holding action

Type of sampling action in which the output variable is held constant during the time intervals between samples (zero-order hold) or varied by a definite law in accordance with preceding samples of the input variable (higher-order hold).

351-05-05

continuous action

Type of action in which a continuous variation between

two limits can be imposed on the output variable.

Note. — Sometimes this type of action is improperly called "modulating action" especially when one wants to stress the fact that the action is not a step action.

351-05-06

step action

Type of action in which only a finite number of values, called steps, can be imposed on the output variable.

351-05-07

switching value

For an element with step action, any value of the input variable at which the value of the output variable changes.

Note. — The value of the output variable may change between two steps for two different switching values (upper and lower value) according to the sense of the variation of the input variable. A nominal switching value is then often used (*see* figure 2).

351-05-08

differential gap

overlap

Difference between the upper and the lower switching values (in the sense of the note of 351-05-07) (*see* figure 2).

Note. — This should not be confused with "neutral zone".

351-05-09

two-step action

Type of step action which imposes on the output variable either one of two steps.

351-05-10

on-off action

Two-step action in which one of the steps is assigned the value zero.

351-05-11

high-low action

Two-step action in which both steps have the same sign.

351-05-12

positive-negative action

Two-step action in which the steps have opposite signs.

351-05-13

multi-step action

Step action with more than two steps.

351-05-14

positive-negative three-step action

Multi-step action with three steps of which one is assigned the value zero and the other two have opposite signs (*see* figure 3).

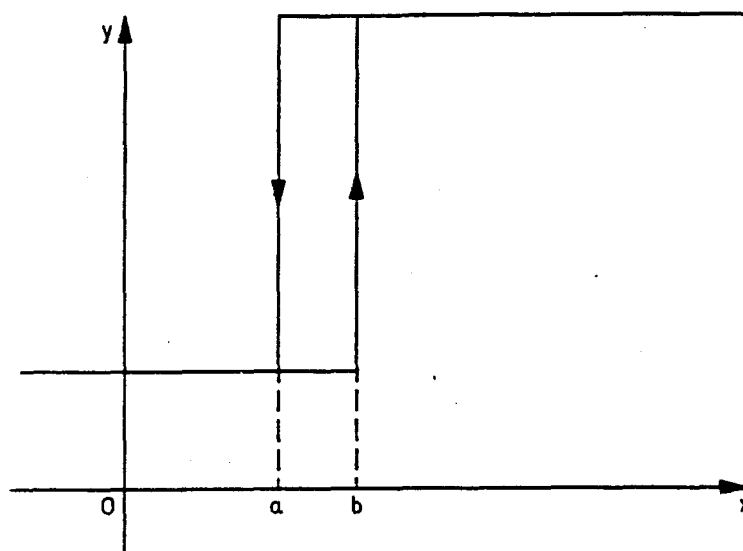


FIGURE 2

(to accompany terms 351-05-07 and 351-05-08)

a = lower switching value
b = upper switching value
ab = differential gap (overlap)

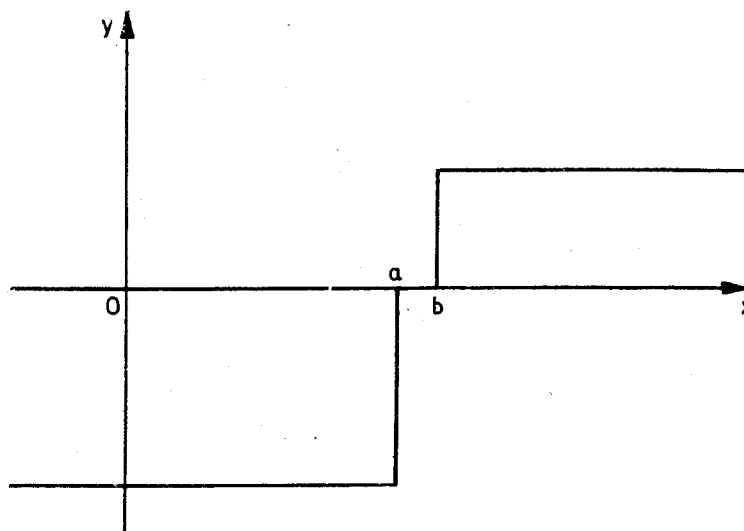


FIGURE 3
(to accompany terms 351-05-14 and 351-05-15)
 ab = neutral zone

351-05-15

neutral zone

In a positive-negative three-step action, difference between the two switching values (see figure 3).

351-05-16

proportional action

P-action

Type of continuous action in which the variations of the output variable are proportional to the concomitant variations of the input variable.

351-05-17

proportional-action coefficient

For an element with proportional action, the ratio of the variation of the output variable to the corresponding variation of the input variable.

351-05-18

floating action

Type of continuous action in which the rate of change of the output variable is a predetermined function of the input variable (i.e., in the case of a controller, of the system deviation).

351-05-19

single-speed floating action

Floating action in which the rate of change of the output variable has only one absolute value.

351-05-20

multiple-speed floating action

Floating action in which the rate of change of the output variable may have several absolute values.

351-05-21

continuous floating action

Floating action in which the rate of change of the output variable may have any value between two given limits.

351-05-22

integral action

i-action

Type of continuous (floating) action in which the rate of change (time derivative) of the output variable is proportional to the concomitant value of the input variable (i.e., in the case of controller, of the system deviation).

351-05-23

integral-action coefficient

For an element with pure integral action, the ratio of the rate of change (time derivative) of the output variable to the concomitant value of the input variable.

351-05-24

integral-action time constant

For an element with pure integral action, the reciprocal of the integral action coefficient, if the input and output variables have the same dimensions.

351-05-25

reset time

For an element with proportional and integral action (PI- action), the input variable of which is given a step-wise variation, the reset time is required for the output variable to reach twice the value of the variation that occurred immediately after the step was applied.

351-05-26

derivation action

D-action

Type of continuous action in which the value of the output variable is proportional to the rate of change (first time derivative) of the input variable (i.e., in the case of a controller, of the system deviation).

351-05-27

derivative-action coefficient

For an element with pure derivative action, the ratio of the value of the output variable to the rate of change (time derivative) of the input variable.

351-05-28

derivative-action time constant

For an element with pure derivative action, the derivative action time constant is equal to the derivative action coefficient if the input and output variables have the same dimensions.

351-05-29

rate time

For an element with proportional and derivative action (PD-action), the input variable of which is given a ramp-wise variation, the rate time is the time required for the output-variable variation to reach twice the value of the variation that occurred immediately after the ramp was applied.

351-05-30

second derivative action

D₂-action

Type of continuous action in which the value of the output variable is at all times proportional to the second time derivative of the input variable (i.e., in the case of a controller, of the system deviation).

351-05-31

composite action

Additive combination of two or more types of continuous actions (PI, PD, PID, PIDD₂, etc.)

351-05-32

type of control

Type of action of the controlling equipment (for instance : continuous control, step control, proportional control, integral control, composite control, etc.)

351-05-33

astatic control

Type of control with zero-offset coefficient in every point of the control characteristic.

351-05-34

cascade control

Type of control in which the manipulated variable is controlled by a secondary control system, the reference variable of which is provided by the main control system: the secondary control system operates in the follow-up mode.

351-05-35

neutral zone control

Type of control where a change of the controlled variable over a well-defined and adjustable portion of the control range does not cause any change in the manipulated variable.

351-05-36

feedforward control

Type of control in which the manipulated variable, while still depending on the controller output, is also made to depend on the measured value of one or more input variables.

351-05-37

measuring range

Interval defined by two values of the measured variable and within which measurements are made within the specified accuracy.

351-05-38

upper [lower] range value

Highest [lowest] value of the variable that a measuring device is adjusted to measure within the specified accuracy; for multirange devices, the upper range value and the lower range value refer to the particular range that the measuring device is set to measure.

351-05-39

measuring span

Difference between the upper and the lower range values.

351-05-40

upper [lower] range limit

Highest [lowest] value of the variable that a measuring device can be adjusted to measure within a specified accuracy.

Note. — For a multi-range device, the upper [lower] range limit is the highest [lowest] of the different upper [lower] range values.

351-05-41

control range

Interval defined by the two extreme values that the controlled variable can assume under specified operating conditions.

351-05-42

correcting range

manipulated range

Interval defined by the two extreme values that the manipulated variable can assume.

351-05-43

proportional band of a controller

In a controller with proportional action, the reciprocal of the gain of the controller expressed as a percentage of the measuring span.

Section 351-06 — System Elements

351-06-01

(measuring) transducer

Device which accepts information in the form of a physical quantity (its input variable) and converts it to information in the form of the same or another physical quantity, according to a definite law.

Note. — There are many different types of measuring transducers, with different names, according to the nature of the physical phenomenon on which they are based :
displacement, angle, velocity, acceleration measuring transducers
flow measuring transducers or flowmeters
measuring transducers for electrical quantities
temperature measuring transducers
force and torque measuring transducers
pressure measuring transducers
deformation measuring transducers
level measuring transducers
analytical elements for chemical and physical measurements.

351-06-02

sensor

detecting device

Part of a measuring transducer which converts the input signal into a form suitable for measurement.

Note. — The relationship between the input and the output variables of a sensor is fundamental and cannot be altered by external means other than physically or functionally modifying the device.

351-06-03

signal convertor

Device which changes a standardized signal into a different standardized signal, the physical nature of the output being the same as that of the input.

351-06-04

process computer

Digital, analogue or hybrid computer which is part of the process control system.

Note 1. — Such a computer can carry out one or more of the following functions :
acquisition (logging) and reduction of data
monitoring and taking logical decisions
specifying set-points
working as a substitute for one or more controllers (that type of operation is called direct digital control when the computer is digital).

Note 2. — The human operator communicates with the computer through a console, an input keyboard, display units, a printing unit, card and tape readers, etc.

Note 3. — The exchange of information between the other parts of the system and the computer is achieved by input and output units which may include a multiplexer, an analogue-to-digital converter, a digital-to-analogue converter, etc. (The detailed computer terminology is determined by ISO/TC 97.)

351-06-05

binary-logic system

System in which binary signals are transmitted, processed or stored.

351-06-06

binary-logic element

binary-logic gate

Two-state element which performs a combinatorial logic operation for instance:

the complementation (it is then called a NOT-gate)
the logical product (it is then called an AND-gate)
the complemented logical product (it is then called a NAND-gate)
the logical sum (it is then called an OR-gate)
the complemented logical sum (it is then called a NOR-gate).

351-06-07

register

Logic system composed of n identical cells having each a logic output and a set of common control inputs (inhibition input, clear input, etc.) and which is intended to store a n -digit binary number.

351-06-08

amplifier

Device used to increase the level of a signal by taking the necessary energy from an auxiliary source.

Note. — One may distinguish voltage, power, torque, etc., amplifiers.

351-06-09

operational amplifier

Amplifier with high gain, high input impedance and low output impedance.

Note. — By adding external elements to an operational amplifier, one can realize summing circuits, integrating circuits and more generally any linear transfer function or any non-linear transformation law.

351-06-10

sampler

sampling element

Signal converter which changes a continuous signal into a sampled signal.

351-06-11

equalizer

compensating element

Element connected in the forward path or in an auxiliary feedback path of a feedback control system and whose transfer function is such that the overall performances of the feedback control system are improved.

Note. — Equalizers can be a lead network, a lag network, a lead-lag network, etc.

Section 351-07 — Final Controlling Elements

The terms defined in the following are examples of final controlling elements; the list is not exhaustive.

351-07-01

final controlling element

Element of the forward path which directly changes the manipulated variable.

351-07-02

actuator

Final controlling element of mechanical type.

Note. — The final controlling elements are generally of mechanical type (valves, dampers, vices, etc.) but they can also be of another nature (exciter of a generator for instance).

351-07-03

valve

Mechanical device which modifies the rate of flow of a fluid.

Note. — The control of the moving part of the valve can be manual or automatic; it can be carried out in a continuous or in a stepwise manner.

351-07-04

valve positioner

An auxiliary control system designed to increase the accuracy and speed of the positioning of the moving part of the valve.

351-07-05

torque variator

speed variator

A coupling device which can be acted on in order to vary the ratio of the angular velocities of a driving shaft

and of a driven shaft (or the ratio of the available torques on these shafts).

351-07-06

solenoid actuator

Actuator in which the displacement of the controlled part is obtained by the armature of a solenoid.

351-07-07

control-motor actuator

servomotor actuator

Actuator in which the displacement of the controlled part is obtained by the movement of a part of a motor.

351-07-08

electronic controlling elements for current

Active electronic components with at least three electrodes (e.g. for a tube, an anode, a cathode and a control grid acting as a current path between anode and cathode when an appropriate signal is applied to the control electrode).

Note. — Examples of such controlling elements are : the thyatron (gas-filled tube with control grid), the thyristor or semi-conductor controlled rectifier (four-layers semi-conducting device with one control electrode, called gate), the silicon controlled switch (four-layers semiconducting device with two control electrodes called cathode gate and anode gate), the triac (which in principle, is a special connection of two silicon controlled rectifiers).

351-07-09

magnetic amplifier

Amplifier in which use is made of the saturation properties of a magnetic core.

Note. — The magnetic amplifier may be used as a current controlling device.

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